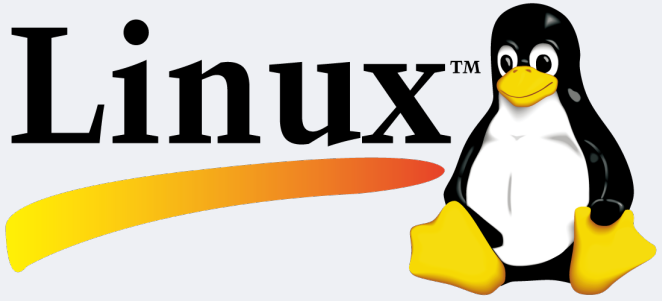
LINUX FOR AMATEUR RADIO

A BRIEF INTRODUCTION

LEE BOULINEAU
KX4TT



What is an Operating System?

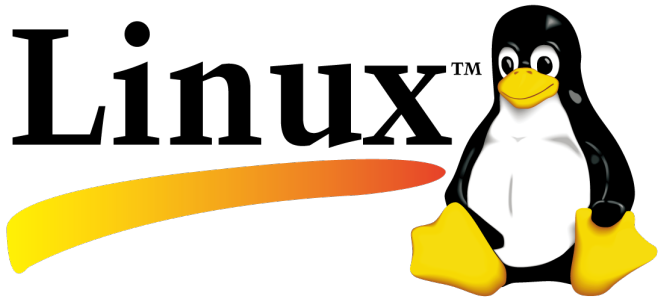
- Manages Hardware access and coordination
- Manages both physical and virtual memory
- Manages Graphics Service
- Manages data flow between hardware – data bus management
- Manages User Environments
  - Desktop Environments
    - Shells
    - Can be Graphical or Text-Only)
    - A Graphical User Interface is a Shell
      - Linux has GNOME, KDE, UNITY, MATE and others

Common Operating Systems

- Windows
  - Shared memory spaces
  - Error in a shared memory space can lock up multiple apps
  - Can be very insecure – hackable!!
- UNIX-Like
  - Monolithic – Directly controlled by the kernel
  - Separate memory spaces for each process
  - This includes Linux
  - AIX/BSD are other OSes you may have heard of (UNIX)

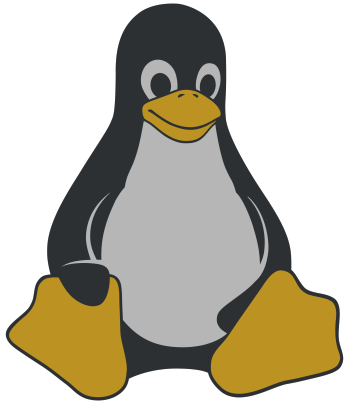
What is Linux?

- It depends on what you are talking about and who you are talking to!!
  - Kernel
  - Distro
  - GNU/Linux



What is a Linux kernel?

- Linux kernel = the core part of the Linux OS that provides interfacing between software and hardware, managing the CPU, management and sorting of memory, and provision of basic services.
- Windows has a kernel (the Windows NT kernel).
- Yes, there is a Windows Subsystem for Linux, but it is not a kernel. It is a compatibility layer that acts as an interface between Linux executables and the Windows NT kernel (and therefore, the hardware and peripherals).
- Android uses a modified Linux kernel.

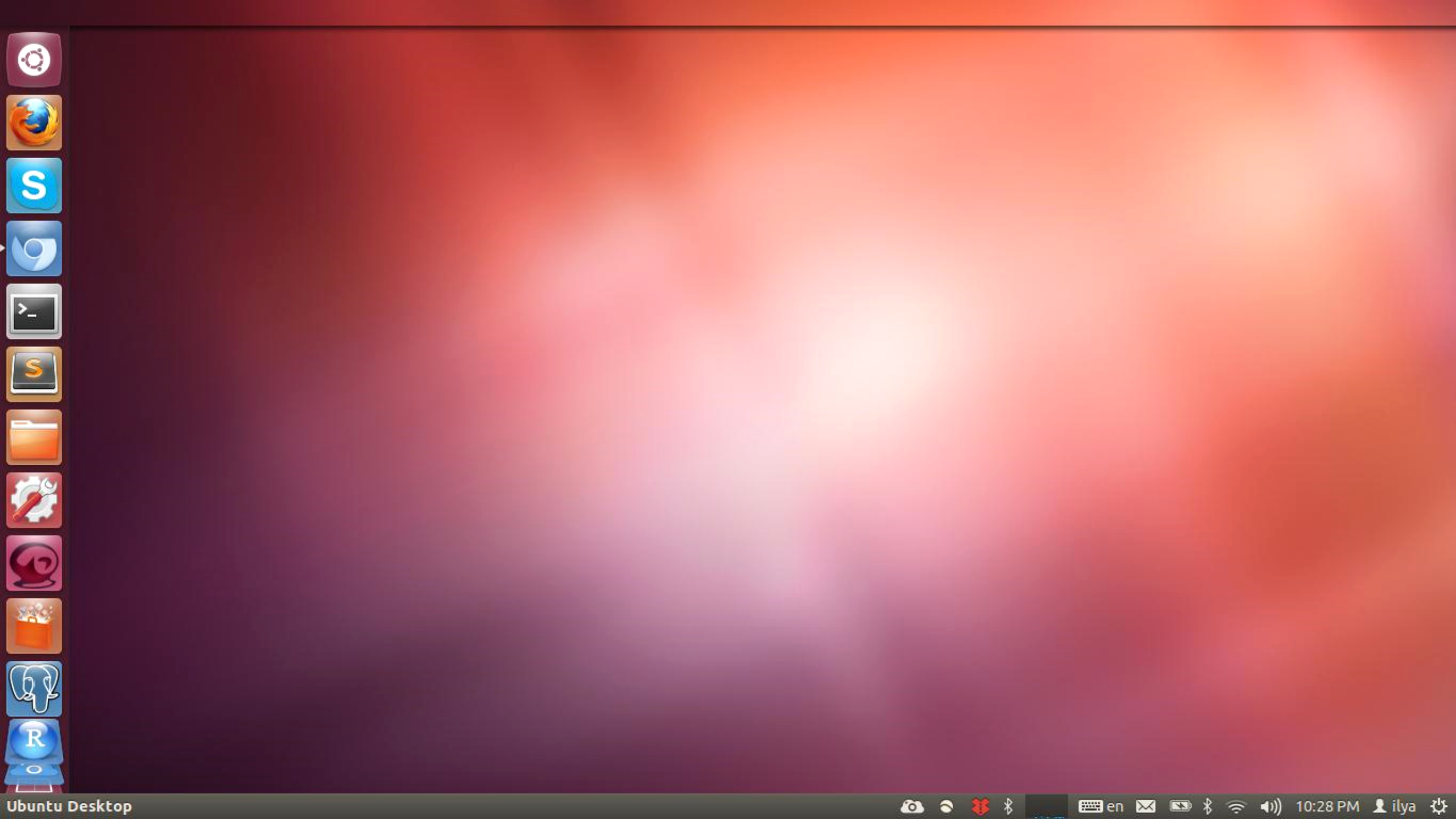


What is a Linux Distro?

- A Linux distro is a complete operating system, just like Windows, UNIX, MacOS, iOS and Android.
- Has a kernel, user environments, shells, GUIs
- Android is a Linux-based system, but the kernel is modified…….so is it a Linux distro? You can't generally run Linux apps on Android and vice versa…..
- MacOS & iOS use some similar functions as Linux as they have a lot of code derived by BSD and Linux, but are not Linux.
- Linux and Unix are not the same Operating System, but tend to follow similar command structures.

What is GNU/Linux?

- It's an operating system plus applications – like the Ubuntu Distro shown on the next slide…….
- So – it is a Linux OS distro plus additional productivity, graphics, game, and entertainment packages
- When you hear that someone has Ubuntu, Red Hat, or Mint on their computer, this is usually what they are referencing.
- Most Linux distros are really GNU/Linux distros.


Ubuntu Desktop
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ilya

Brief History of Linux

- By 1990 – you had UNIX (AT&T) and BSD (Unix-like)
  - AT&T wanted to commercialize Unix in the 80s– big $$$$
  - Lawsuit by USL (who bought AT&T UNIX) against BSD
  - Linux went through lawsuits in early 2000s
- Linus Torvalds – started writing the kernel in the early 90s.
  - Started with MINIX – a Mini-UNIX
- Richard Stallman - Free Software Foundation.
  - C Compiler – still the Gold Standard
  - Started writing a UNIX-like OS (GNU Project)
- Open Source Development Labs - became Linux Foundation
- Free Standards Group – Developed open source standard
- Linux Foundation – Merger of the two groups in 2007

Why not UNIX?? Or BSD?

- UNIX was Proprietary – AT&T Bell Labs,then USL, then Novell
- Xenix (a Microsoft, and later SCO port of UNIX to the Intel 8086/80286 series of processors) was expensive – and end users often had to buy Windows for Xenix to get a GUI for the non-techies
- Lawsuits abounded over the use of UNIX code
  - USL vs. BSD, Novell vs. Linux
- BSD lawsuit left cloud of possible legal trouble
- BSD didn't require open-source posting of kernel code (no GPL license)
- Since BSD was written by small set of developers, it discouraged crowd-sourced innovations – unlike Linux

So – Why use Linux over Windows??

- Again, It depends!!
  - Many Flavors (Distros) means Many Choices
  - Portable – can be ported onto other hardware
  - Powerful – less load on CPU when configured properly
  - Flexible – doesn't need the fastest or latest hardware
  - Allows you more control over most aspects of the OS
  - Secure – IF YOU STAY OUT OF ROOT!!
  - Most Distros are Free

Why use Linux as a Ham Radio OS?

- Many of the same reasons as using it for everyday computing
- Ready-Made Programs for Amateur Radio
  - Fldigi – PSK/RTTY/Digital modes
  - WSJT-X – FT4/FT8/MSK144
  - Xlog – Logging
  - Gpredict – Satellites
  - RTLSDR – SDR controller
- Many general use programs – Browsers, e-mail, Office, A/V
- Compatibility Layers that will run some Windows programs (WINE)
- KB1OIQ has a Ham Radio Linux GNU/Distro!
- AB0VI, ON4AA, and our own K2LYV use Linux in amateur radio
- HamOS – Debian-based Linux distro for amateur radio

Flavors of Linux – Hardware is important

- There are lots of different Distros of Linux
- You must evaluate your hardware before choosing one!!
  - Ubuntu 19.10 needs 2 Ghz dual-core CPU / 4 Gb RAM
  - The standard GNOME Desktop can be a power hog
  - You can change over to Unity or LXDE (see below) to save power.
  - With an older system, Lubuntu will work with 256 Mb (likes 512 Mb)
  - The LXDE Desktop is also lighter on the CPU.
  - Other lightweight distros are Xubuntu, Linux Lite, Puppy Linux
    - These releases can breathe new life into an old computer
- This is even more critical with single-board computers!

Flavors of Linux – .rpm and .deb

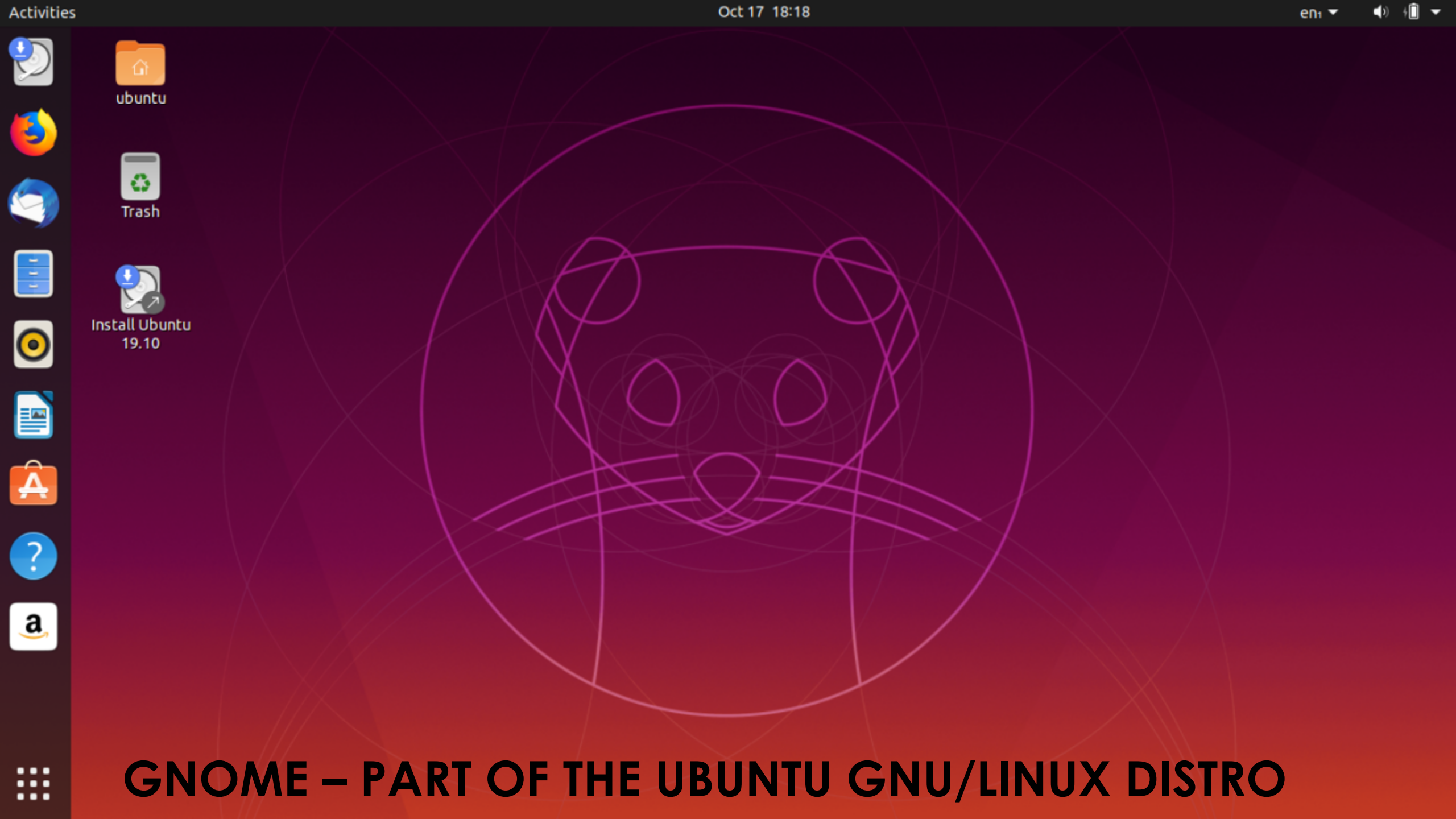
- Different Package Management Systems (Installers)
- Most Flavors of Linux use one of these two systems
  - .rpm - originally used in Red Hat Linux
    - Now used in Fedora/CentOS/SUSE
    - yum, apt-rpm, Smart Package Manager make software installs easier
  - .deb - Many Linux Distros are based on Debian
    - Ubuntu, PureOS, Lubuntu, Xubuntu, Kubuntu, Mint
    - apt - Advanced Packaging Tool is the .deb equivalent to yum
    - apt-get will be used a lot (or sudo apt-get; hang around for K2LYV!!)
  - There are other managers used, like pacman and portage
  - Slightly different commands, but similar properties

Flavors of Linux – .rpm and .deb Part 2

- Command examples for .rpm and .deb
  - Installing Xlog in an .rpm system
    - yum install Xlog (if in a repository)
    - yum localinstall Xlog (if on the local machine)
  - Installing Xlog in an .deb system
    - apt-get install Xlog (if in a repository or on the local machine)
  - sudo may be required depending on your login
- Since the commands differ between them, it may be wise to stiff to Distros using the same manager for all systems.
  - For instance, you may wish to use Ubuntu on your desktop if you plan on using Raspbian on a Raspberry Pi……

Flavors of Linux – Desktops

- You can change out Desktop Environments through your Package Manager
  - GNOME
    - Part of Ubuntu Distro
    - A bit of a resource Hog
  - KDE
    - Part of Kubuntu
    - Also a bit of a resource hog
  - Trinity
    - Very Windows-like in appearance
  - MATE and XFCE – use less resources than GNOME/KDE


Activities
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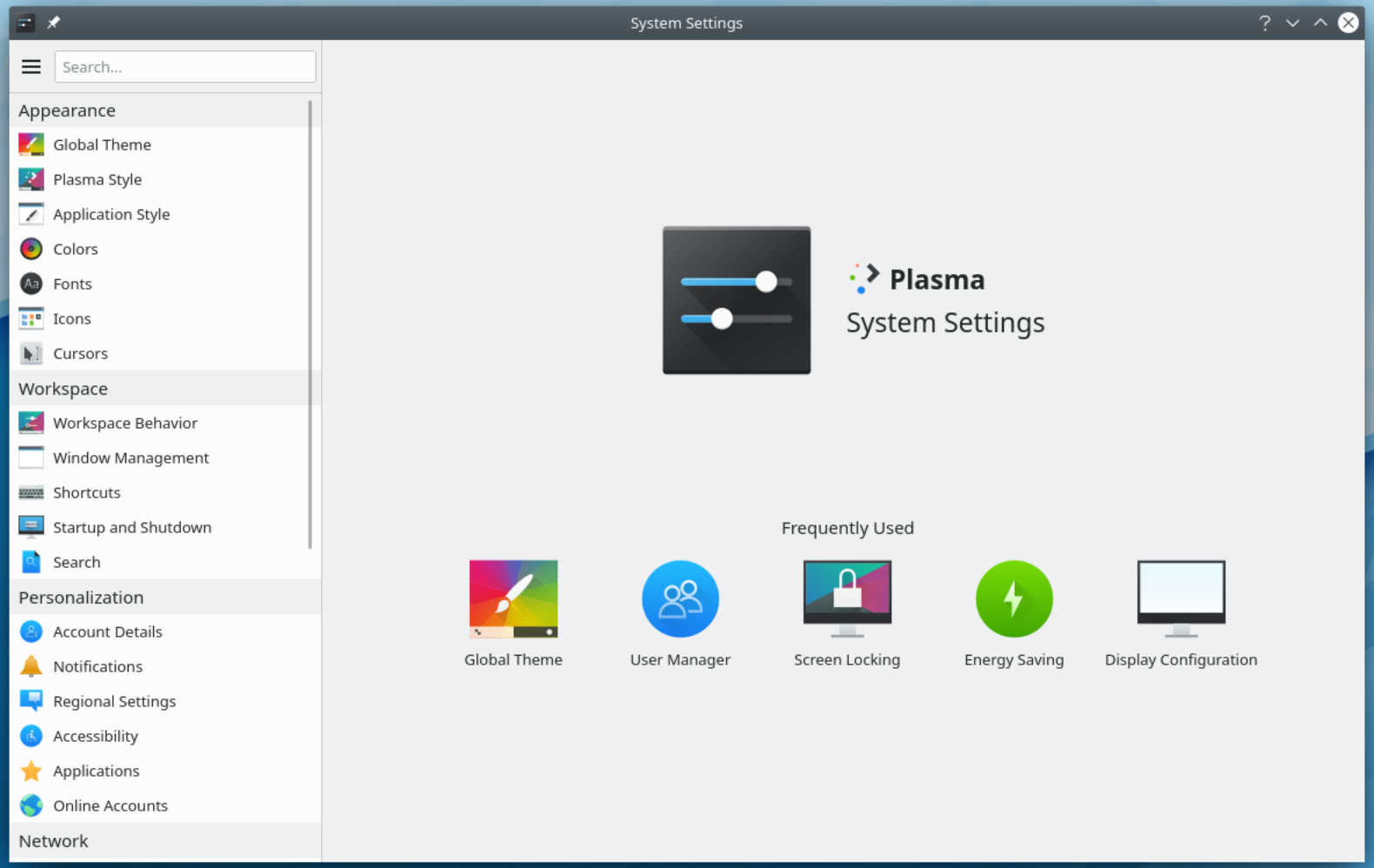
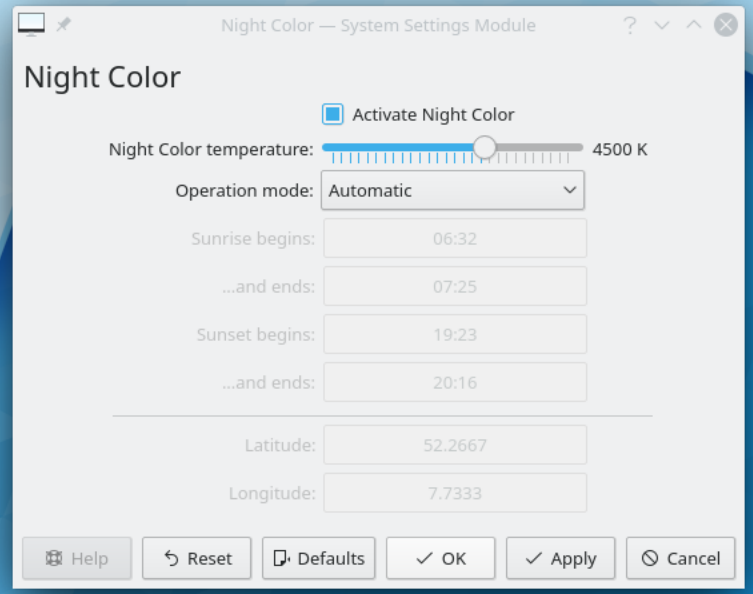
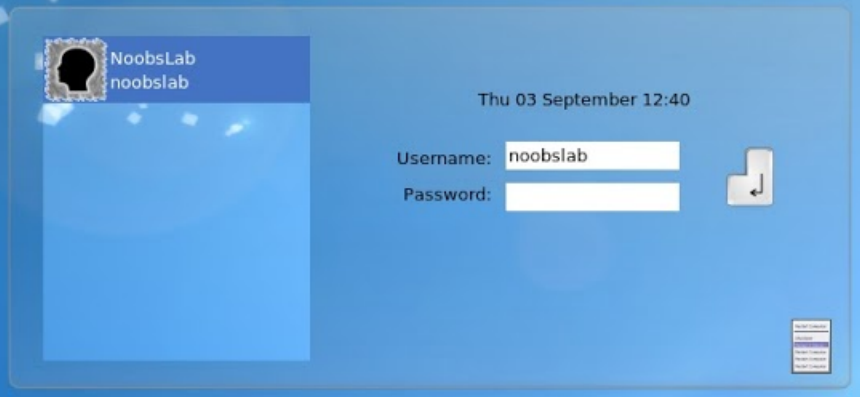
en
ubuntu
Trash
Install Ubuntu 19.10
GNOME – PART OF THE UBUNTU GNU/LINUX DISTRO

KDE – PART OF THE KUBUNTU GNU/LINUX DISTRO

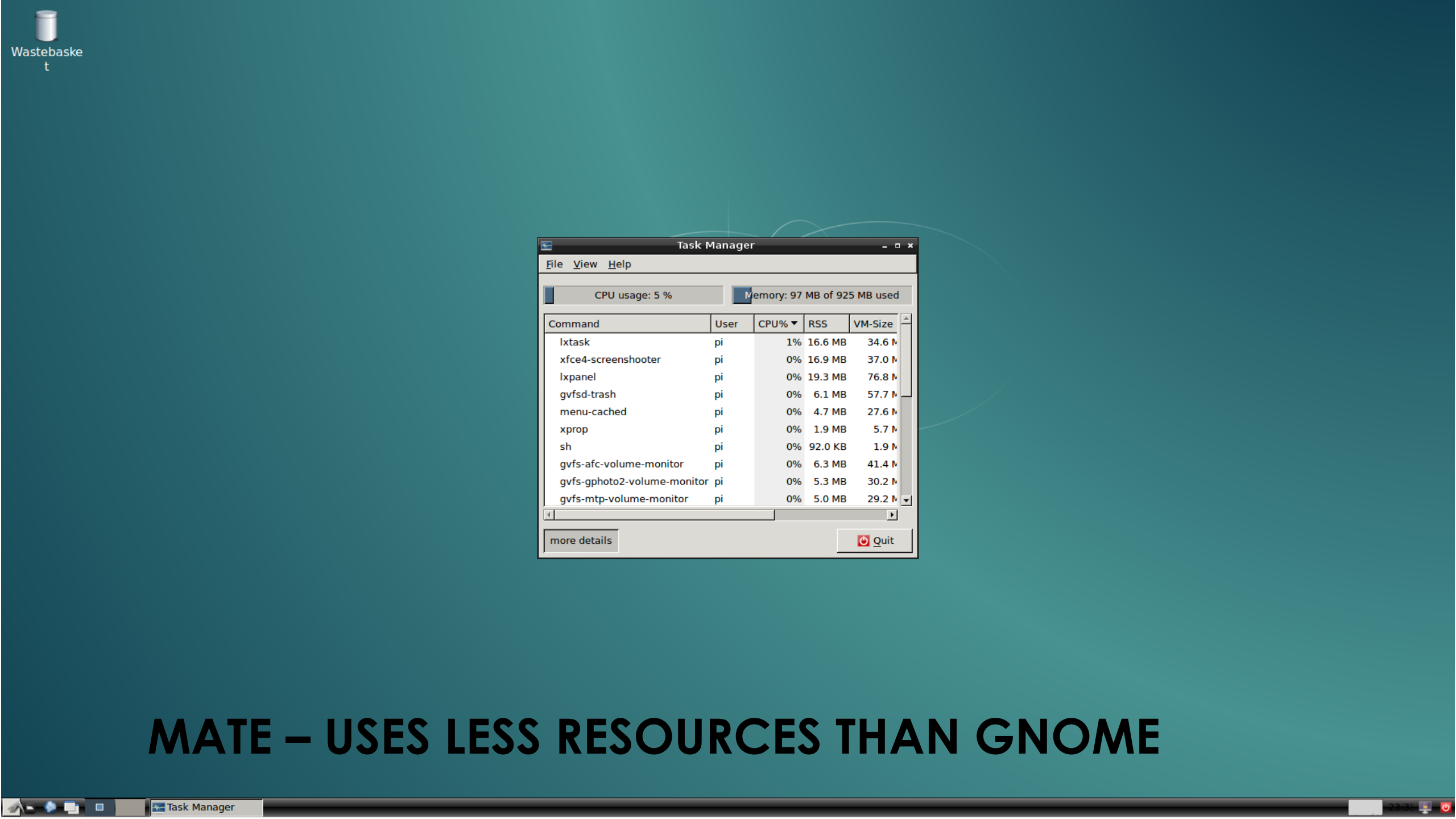




TRINITY DESKTOP – VERY TRADITIONAL APPEARANCE



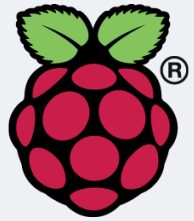
kubuntu
Powered by Trinity



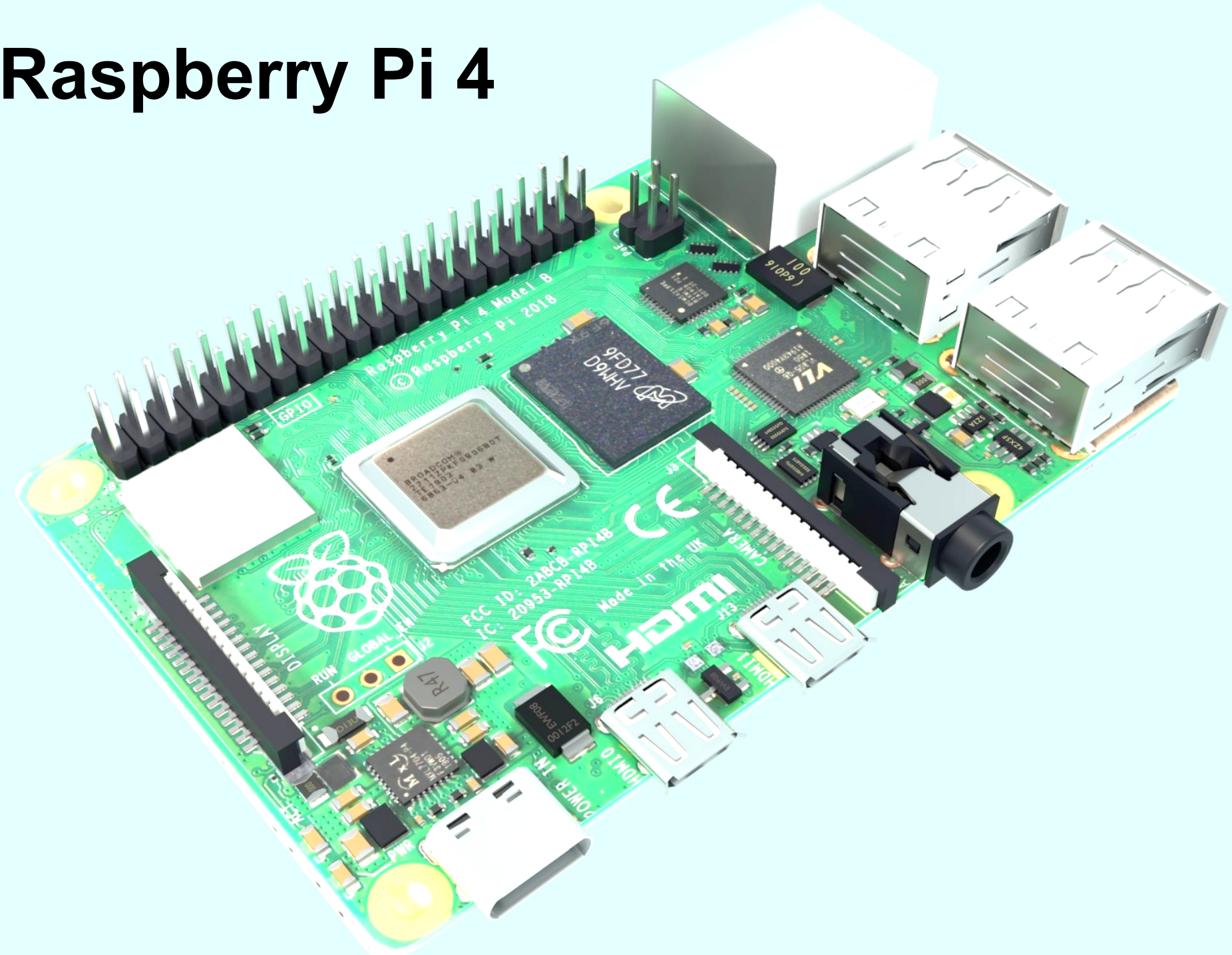
MATE – USES LESS RESOURCES THAN GNOME

Portability – Single Board Computers

- Raspberry Pi – has Raspbian as the basic Linux OS
  - Other Linux Operating Systems available
    - Ubuntu Mate, Snappy Ubuntu Core, OpenELEC
    - RaspBSD – not Linux, but very similar (BSD-based)
- ARM-based platforms (Android Phones often use these)
  - Pine A64 series ,Odroid Arduino Portenta – ARM Cortex
  - BeagleBoard – uses TI ARM-based CPU
- Other CPU platforms – Atmel Atmega (32-bit)
- Ported onto Chromebooks / Kindle readers / Android Phones



Raspberry Pi 4



SO – YOU WANT TO TRY LINUX OUT !!
TRY BEFORE YOU BUY!!!!

- **OLDER SYSTEMS – REPLACING XP, FOR INSTANCE**
  - **Example - Pentium or Celeron G Series and 1-2 Gb RAM**
    - **Lubuntu will run nicely on this kind of hardware**
    - **Uses LXDE Desktop – less power required than GNOME or KDE**
  - **Gotchas**
    - **Using high-requirement apps**
      - **Ex – Google Chrome may strain things a bit**
      - **Midori is a example of a nice lightweight web browser**
    - **When installing apps, especially on older hardware, pay attention to the dependencies – they can add up to a large chunk of CPU power and/or memory**
  - **Other Linux Distros for old hardware**
    - **Linux Lite, Peppermint, Bodhi, Puppy Linux**

- **MORE MODERN SYSTEM – UBUNTU IS A GOOD CHOICE**
  - **Trying it out without installing on your hard drive**
    - *https://tutorials.ubuntu.com/tutorial/try-ubuntu-before-you-install#0*
    - **Has options for burning a DVD or a bootable USB stick**
    - **DOES NOT AFFECT EXISTING OPERATING SYSTEMS IF YOU PAY ATTENTION**
  - **DVD option – Gotchas**
    - **Not burning the drive correctly- must use a .iso burner**
    - **ISO Recorder is good for this and is freeware**
  - **Bootable USB - Gotchas**
    - **Not configuring as Bootable!**

QUESTIONS???

ASK K2LYV ;-)

LINUX
PCLinuxOS
Freedom. Choices. Beautiful.